

May 22, 1956

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2,746,894

RESILIENT FIBER PAD AND METHOD OF MAKING SAME

Filed Oct. 22, 1953

2 Sheets-Sheet 1

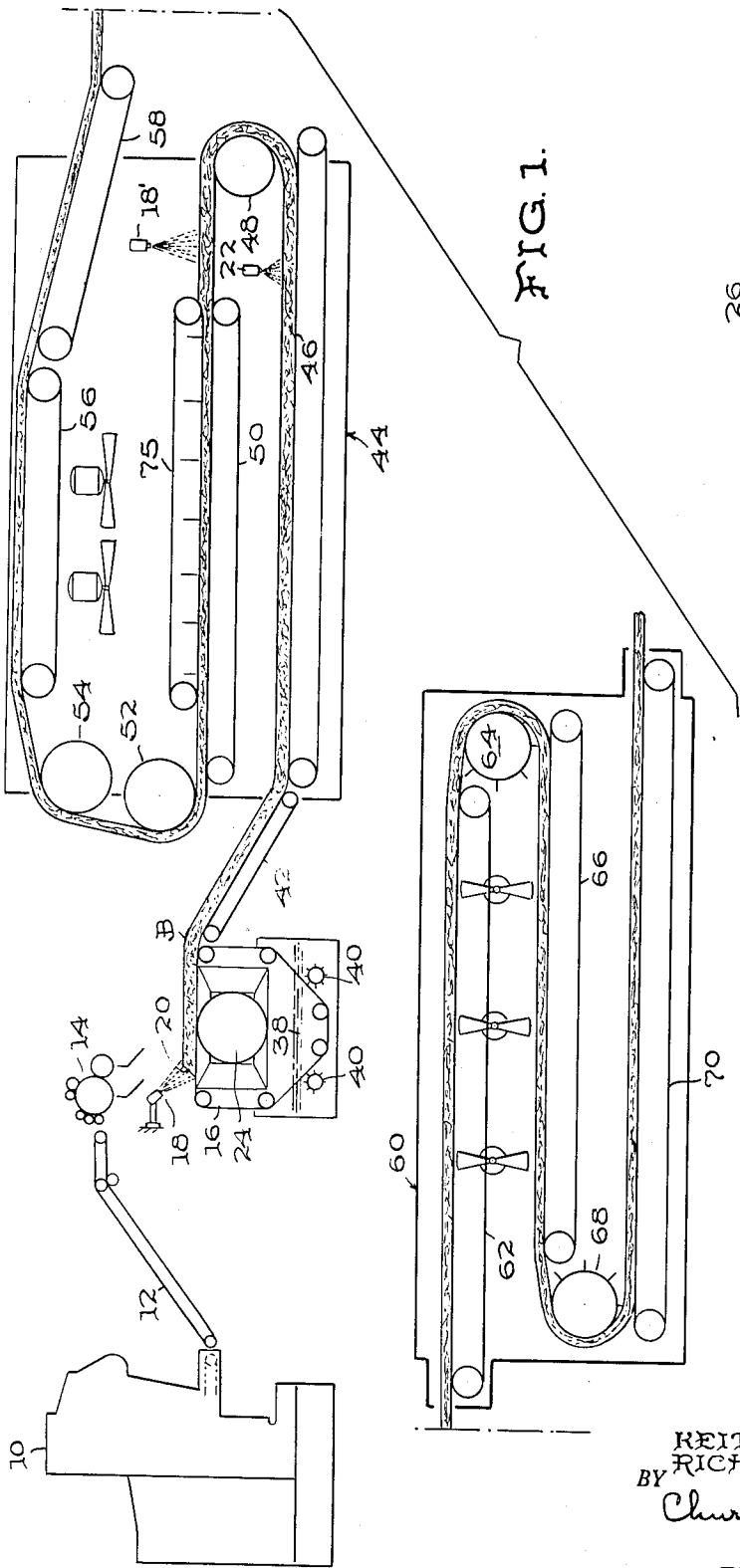


FIG. 1.

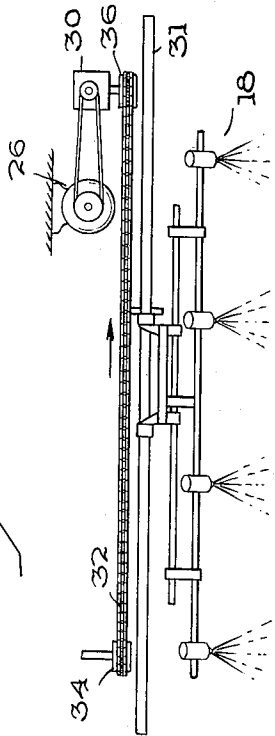


FIG. 3.

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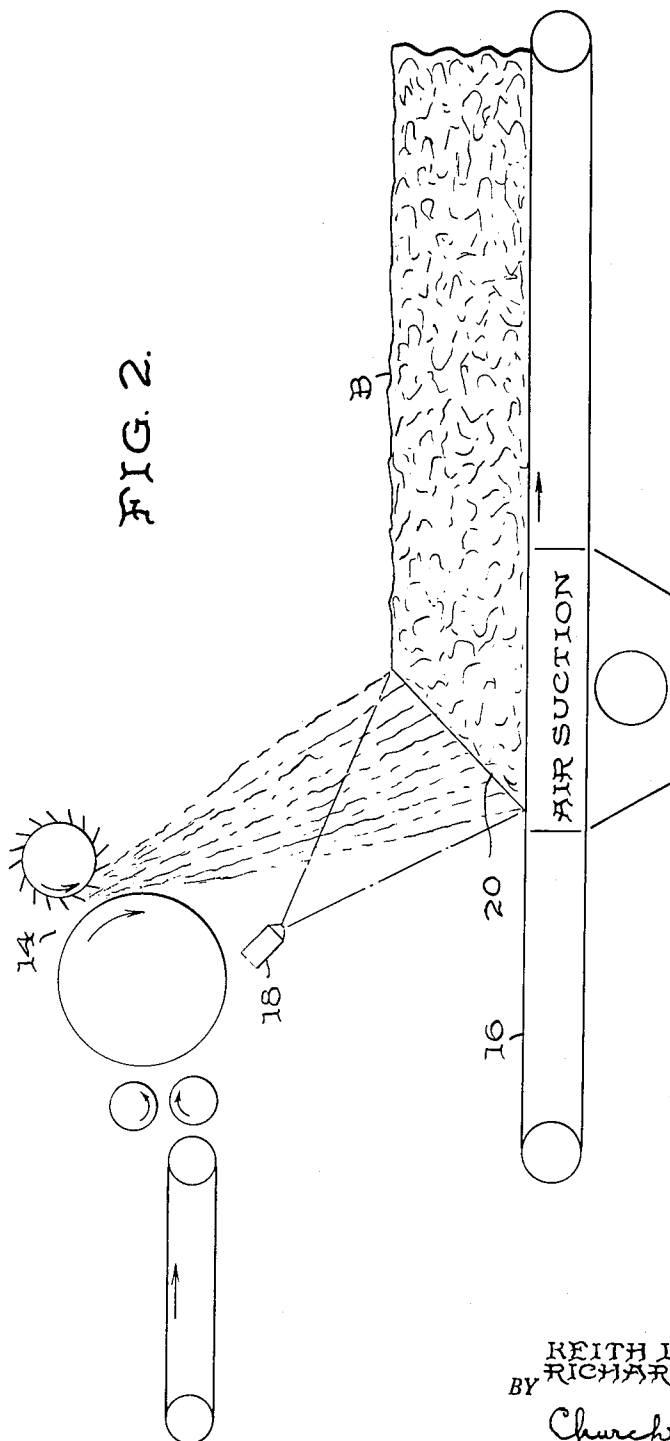
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RESILIENT FIBER PAD AND METHOD OF MAKING SAME

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Application October 22, 1953, Serial No. 387,682

8 Claims. (Cl. 154—101)

This invention relates to the fabrication of resilient fiber pads or batts, and more particularly to a method of fabricating fiber pads or batts impregnated with a rubber-like composition and to an improved fiber pad or batt fabricated by this method.

Fiber batts formed of curled fiber, such as animal hair, istle, sisal, or coir (cocoanut fiber) are widely used in upholstery padding, bedding, and packaging material. When it is desired that such fiber batts or pads have resilient properties, it is the general practice to spray upon the sides of a web of the curled fibers an elastomer such as a natural or synthetic rubber composition, such as latex, for example. Hereinafter in this specification, the term "latex" will be used to describe the natural or synthetic rubber-like composition which is sprayed upon the fiber material in accordance with this invention. However, it will be understood that this term is used to cover any natural or synthetic rubber-like composition which might be used for this purpose.

In preparing resilient fiber batts in accordance with the prevailing methods, the latex is usually sprayed first upon one side of the fiber web and then upon the other side. A serious objection to the impregnation of fiber batts with a rubber composition by the method just mentioned is the fact that for a batt of any given thickness, the rubber composition is concentrated in greater quantities near the outer surfaces of the batt, and is therefore not uniformly distributed throughout the thickness of the batt. To have any penetration of the batt, an excessive quantity of latex must be sprayed upon the side. Furthermore, the thickness of a batt which can be impregnated in this manner is limited to two or three inches.

Accordingly, it is an object of this invention to provide an improved method for uniformly impregnating a fiber batt with a rubber-like composition, such as a natural or synthetic rubber composition or elastomer.

It is a further object of this invention to provide an improved resilient fiber batt having an impregnating compound of rubber-like material substantially uniformly distributed throughout the body of the fiber batt, regardless of the thickness of the batt.

It is a still further object of a modified form of the invention to provide a fiber batt and a method of forming a fiber batt in which a rubber-like composition is substantially uniformly distributed throughout the body of the batt, with one or both of the outer surfaces of the batt having a strong, flexible outer skin which serves as a protective covering for the batt.

In accordance with these objectives, this invention provides a method and apparatus for preparing a resilient fiber batt in accordance with which the fiber material is discharged by a spreading device onto a moving conveyor. A bank of traversing spray guns positioned adjacent the point of discharge of the fibers from the spreader sprays a rubber-like composition onto the inclined surface of the batt formed by the fibers as they are deposited in a shower onto the conveyor by the spreader. To avoid soaking the conveyor with the rubber composition, the angle subtended

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by the spray does not extend below a height of about one inch above the conveyor surface. The conveyor then carries the batt built up by the deposited fibers through a drier where the batt is turned on a rotary drum so that what was the underneath surface during the first spraying operation becomes the upper surface after passing over the drum. A second set of spray guns which may be located in the drier then applies a light spray to the upper surface of the batt, to compensate for the lower degree of impregnation adjacent that surface caused by the position of the spray guns during the first spraying operation. After passing through the drier the batt is then carried by a conveyor through a vulcanizer.

In the modified form of the invention, a strong, flexible outer skin is formed on one or both of the outer surfaces of the batt by the application of heat and pressure in conjunction with an additional spraying operation directed toward the surface or surfaces to form the outer skin.

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, itself, both as to its organization and use, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a diagrammatic representation of the method and apparatus for preparing a fiber batt in accordance with the present invention;

Fig. 2 is an enlarged detail view of the first spraying operation; and

Fig. 3 is a diagrammatic representation of an apparatus used for traversing the spray guns across the width of the fiber batt.

Referring now to the drawing, the curled fiber material is discharged by a volumetric feeder 10 onto an upwardly inclined conveyor 12 which carries the fiber to a spreader 14 which has an over-all width equal to that of the fiber batt which is to be prepared. The spreader 14 is positioned above a moving conveyor apron 16 which moves in a clockwise direction with respect to the view shown in the drawing. The spreader discharges a shower of the curled fibers fed to it from conveyor 12 so that the fibers drop downwardly to build up on the moving conveyor 16 a batt of a predetermined width. A battery of traversing spray guns or spraying unit generally indicated at 18 and shown in more detail in Fig. 3 directs a spray of a rubber-like composition, such as latex, for example, at a downwardly inclined angle onto the inclined surface 20 of the batt B which is built up on the moving conveyor 16 by the deposited fibers. In the average case, nozzles of the spray guns should preferably be positioned about 16 inches above the surface of conveyor 16 and should be inclined at an angle of approximately 30 degrees from the horizontal. The thickness of the batt is determined by the speed of the conveyor and by the rate of discharge of fibers from the spreader. Spraying of the batt as it builds up on the moving conveyor 16 coats the fibers as they fall into place on the inclined surface 20 and provides a substantially uniform application of the rubber composition throughout the thickness of the batt. The spraying angle subtended by the spray guns 18 is such that the spray extends from slightly above the upper surface of the batt to reach the uppermost surfaces of fibers on the top surface of the batt to a portion of the inclined face 20 approximately one inch above the surface of the conveyor apron 16 to avoid soaking the conveyor 16 with the latex. As a result, the portion of the batt lying on the inclined surface 20 below the range of the spray guns is not quite as thoroughly impregnated as is the portion of the batt above the one-inch height. However, this condition is

compensated for in a subsequent spraying operation which will be described.

As will best be seen in Fig. 3, the battery of spray guns 18 is mounted on a carriage which rides on a track 31. This carriage is driven back and forth on the track by a continuous roller chain 32 traveling over sprockets 34 and 36, sprocket 36 being driven by a motor 26 through a variable speed unit 30. More specifically, a pin on one link of chain 32 engages the carriage and carries it back and forth across the width of the batt. Means are also provided for automatically shutting off the spray guns as they approach the end of the stroke and turning them on again as the next stroke is started. Means are provided for adjusting the vertical height of the spray guns 18 and also for adjusting the angle of the spray guns to accommodate batts of different thicknesses.

The upper surface of apron conveyor 16 upon which the fiber material is first deposited is positioned over an exhaust box 24 which is connected to a source of suction, which may be provided by one or more exhaust fans. The construction of conveyor 16 is such that the suction applied through the exhaust box 24 is communicated through the conveyor 16 to remove the air delivered by the spray guns while simultaneously drawing the latex spray down into the batt. The air motion through the conveyor to the exhaust box removes moisture from the latex and partially seizes the latex to the fibers.

The apron conveyor 16 passes downwardly below the exhaust box 24 into a water bath 38, being engaged by rotating scrubbing brushes 40 as it passes through the water bath.

The fiber batt B is picked up from the apron conveyor 16 by a downwardly inclined conveyor 42 which passes it into the lower level of a drier generally indicated at 44 where it is first picked up on a horizontally moving conveyor 46. In an operative embodiment of the invention which has been constructed, the conveyor distance from the spraying station 18 to the entrance to the drier is of the order of magnitude of 10 feet-15 feet, while the conveyor distance from the left-hand to the right-hand side of the drier is of the order of magnitude of 30 feet. The conveyor speeds are of the order of magnitude of 5 feet-20 feet per minute. The batt is carried by conveyor 46 to the right-hand end of the drier with respect to the view shown in the drawing where the batt passes up over a drum 48 which reverses the direction of travel of the batt and causes the original under surface of the batt to become the upper surface of the batt. The batt is delivered from drum 48 to a conveyor 50 which carries the batt toward the left-hand end of the drier.

After the batt passes around the drum 48, the upper surface of the batt is sprayed at a second spraying station by a bank of traversing spray guns generally indicated at 18'. The spray guns 18' are similar to the previously described spray gun bank 18, being driven by an arrangement similar to that previously described. However, the spray guns 18' are directed straight down toward the horizontal upper surface of the batt rather than being angularly inclined as in the case of the spray guns 18. The spraying operation performed at the second spraying station by the spray guns 18' compensates for the lower degree of impregnation adjacent the original underneath surface of the batt as previously described.

The fiber batt B passes off of conveyor 50 and upwardly around drums 52 and 54 which again reverse the direction of travel of the batt, causing it to move toward the right. After leaving drum 54, the batt is picked up by horizontally moving conveyor 56 which carries the batt toward the right-hand end of the drier where it is picked up by a downwardly moving conveyor 58 which carries the batt to the vulcanizer generally indicated at 60.

The batt enters the vulcanizer 60 at an upper level thereof and is carried by a horizontally moving conveyor 62 toward the right-hand end of the vulcanizer where it passes around a drum 64 which reverses the direction of travel of the batt. After leaving drum 64, the batt is picked up by horizontally moving conveyor 66 which carries it toward the left-hand end of the vulcanizer. At the left-hand end of the vulcanizer, the batt passes around a drum 68 and again reverses direction, being picked up by horizontally moving conveyor 70, which carries the batt toward the exit at the lower right-hand end of the vulcanizer.

The method of forming a fiber batt as hereinbefore described has numerous advantages over the conventional system wherein the fiber batt is sprayed on each side after formation of the batt. By spraying the inclined surface of the batt built up by the curled fibers as they drop in a shower from the spreading device to the conveyor apron, the fibers are substantially uniformly coated with the rubber composition rather than having the rubber-like composition concentrated near the outer surface of the fiber batt with a decreasing ratio of rubber to fiber going from the outer surface toward the center of the batt. By providing a second spraying station to lightly spray the original under surface of the batt, any possible unequal distribution of the rubber-like composition adjacent the original underneath side of the batt due to the spraying angle of the first bank of spray guns is corrected.

Furthermore, there is no limit to the thickness of a rubber-impregnated resilient batt which can be made in accordance with the method of this invention whereas there is a definite limit of about two to three inches batt thickness when the latex or rubber composition is applied by spraying the outer surfaces of an already fabricated web, in accordance with the usual procedure. Due to the uniform distribution of the rubber impregnating composition throughout the body of the batt in accordance with the method of this invention, a lower ratio of rubber composition to fiber yields as good a product as a much higher ratio of rubber composition to fiber in the conventional procedure. In other words, by use of the method and apparatus of this invention, an equally good product can be obtained for less cost, or a better product can be obtained for the same cost as compared to conventional methods of fabricating rubber-impregnated resilient fiber batts.

In the case of very thick fiber batts, a third spray 22 (Fig. 1), similar to unit 18', may be used to spray the original upper surface of the batt to thereby permit the angularly inclined spray unit 18 to be used for application of latex only to what becomes the interior of the batt. It will be remembered that in the spraying operation as originally described the uppermost range of the spraying unit 18 was slightly above the top of the batt in order to coat the uppermost surfaces of the fibers on the top surface of the batt. Use of the additional spraying unit 22 permits the angle subtended by the spraying unit 18 to extend only to the top of the batt, rather than slightly above the surface of the batt. Spraying unit 22 may be disposed in any convenient location where it will spray the original upper surface of the batt B before the batt has been inverted by drum 48. Like spraying unit 18', spraying unit 22 should be directed vertically downwardly toward the surface of the batt rather than have an inclined spraying angle.

The spraying units 18' and 22 may also be used to practice the modified form of the invention in which a protective skin is formed on one or both of the outer surfaces of the batt B. When the spraying operations of spraying units 22 and 18' onto the respective surfaces of the batt are followed promptly by the application of heat and pressure before the composition sprayed during these operations has had time to dry, a strong, flexible outer skin is formed on the two opposite surfaces of the batt.

When the damp outer surfaces produced by the spraying

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units 22 and 18' are subjected to the simultaneous effect of heat and pressure, the latex is dried rapidly causing the skin effect.

In the embodiment shown, the necessary pressure is applied by an adjustable heated hold-down apron 75 positioned above the surface of the batt B as the batt is moved by conveyor 50 in the drier 44. The apron 75 may be adjusted to different heights above the surface of conveyor 50 in order to compress batt B to a desired predetermined thickness. The pressure used to produce the skin effect is in the same range as that normally used in the art for compressing fiber batts from their original low density to a reduced volume of higher density. Such compression may reduce the volume of the batt from one-third to one-sixth of its original volume, for example. The temperature range at which the skin effect is obtained is the same as that ordinarily used in the art for drying fiber batts which have been sprayed with a rubber-like composition.

If both surfaces of the batt are sprayed by the respective spraying units 18' and 22 with the batt subsequently being passed under the hold-down conveyor 75 in the heated atmosphere of the drier, then the skin will be formed on both surfaces of the batt. If it is desired that only one outer surface of the batt have the skin effect, then only the surface which is to have the skin effect is treated to the combined effects of the surface spray plus the application of heat and pressure. The thickness of the outer skin formed in this manner can be adjusted by regulating the rate of flow of the composition from the respective spray units 18' and 22.

The skin effect hereinbefore described provides a strong outer surface on the batt which eliminates the need for application of fabric or net surfaces to the rubberized material to add strength when the material is used over metal springs. The fiber batt provided with the skin effect has adequate strength without the addition of cotton or similar nettings which are not rubberized and which are more subject to deterioration.

While there have been shown and described particular embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications can be made therein without departing from the invention and therefore it is aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What we claim as our invention is:

1. The method of making a resilient fiber batt which comprises the steps of depositing fibers onto a moving conveyor, spraying said fibers with a rubber-like composition as they are being deposited on said conveyor, and after said fibers have formed a batt body spraying an outer surface of said batt with a sufficient amount of said rubber-like composition to form a skin on said outer surface of said batt but insufficient to substantially fill the pores of said batt.

2. The method of making a resilient fiber batt which comprises the steps of depositing fibers onto a moving conveyor, spraying said fibers with a rubber-like composition as they are being deposited on said conveyor, and afterwards additionally spraying an outer surface of said batt

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with a sufficient amount of said rubber-like composition to form a skin on said outer surface of said batt but insufficient to substantially fill the pores of said batt.

3. The method of making a resilient fiber batt which comprises the steps of depositing fibrous material onto a moving conveyor to build up on said conveyor a batt having an inclined end face, directing a spray of a rubber-like composition toward said end face to coat said fibers as they fall into position on said end face, and afterwards additionally spraying an outer surface of said batt with a sufficient amount of said rubber-like composition to form a skin on said outer surface of said batt but insufficient to substantially fill the pores of said batt.

4. The method of making a resilient fiber batt which comprises the steps of depositing fibrous material onto a moving conveyor to build up on said conveyor a batt having an inclined end face, directing a spray of a rubber-like composition toward said end face to coat said fibers as they fall into position on said end face, and afterwards additionally spraying an outer surface of said batt with said rubber-like composition, followed by the application of heat and pressure to said batt to form a skin on said outer surface, the amount of additionally sprayed rubber-like composition being sufficient to form a skin on said outer surface of said batt but insufficient to substantially fill the pores of said batt.

5. The method of making a resilient fiber bat which comprises the steps of depositing fibrous material onto a moving conveyor to build up on said conveyor a batt having an inclined end face, directing a spray of a rubber-like composition toward said end face to coat said fibers as they fall into position on said end face, and afterwards additionally spraying an outer surface of said batt with said rubber-like composition, followed by the substantially simultaneous application of heat and pressure to said batt to form a skin on said outer surface, the amount of additionally sprayed rubber-like composition being sufficient to form a skin on said outer surface of said batt but insufficient to substantially fill the pores of said batt.

6. A fiber batt formed of curled fibers coated with a rubber-like composition and having a substantially uniform distribution of rubber-like composition throughout the body of said batt and a skin coating layer of rubber-like material on at least one surface of said batt.

7. A resilient pad comprising a batt of curled fibers having a rubber-like composition substantially uniformly distributed throughout the batt and a skin coating layer of rubber-like material on at least one surface of said batt.

8. A resilient pad comprising a batt of curled fibers having a rubber-like composition substantially uniformly distributed throughout the batt, said batt having a strong, flexible skin coating layer of said composition on at least one of its outer surfaces.

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